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NAVAL POSTGRADUATE SCHOOL

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THESIS

REDUCING SUPPLIER OVERSIGHT: AN ANALYSIS OF
SUPPLIER QUALITY ASSURANCE PRACTICES USED BY
DEFENSE CONTRACTORS AND MALCOLM BALDRIGE
NATIONAL QUALITY AWARD WINNERS

by

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December 1991

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Reducing Supplier Oversight: An Analysis of Supplier Quality Assurance
Practices Used by Defense Contractors and Malcolm Baldrige
National Quality Award Winners

by

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Submitted in partial fulfillment
of the requirements for the degree of

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ABSTRACT

This study attempted to identify the practices used by defense contractors and recipients of the Malcolm Baldrige National Quality Award to reduce or eliminate the oversight of suppliers. A comparison of the practices used by the companies who responded to a survey questionnaire inquiring about their specific programs was made.

An analysis indicates that common oversight reducing practices used by defense contractors and Baldrige winners include supplier certification programs, involving suppliers early and throughout the supply cycle, and developing and assisting suppliers in improving their performance.

The research concluded that defense contractors encounter more difficulties than Baldrige winners in establishing cooperative, long-term relationships with suppliers because of requirements and restrictions imposed by the Federal Government. These include rules, laws and regulations that hinder defense contractors' ability to achieve higher levels of quality.

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I. INTRODUCTION

A. BACKGROUND

During the past decade, quality has become the number one topic among American businesses. Along with the Federal Government, American businesses have begun to focus their attention on quality as the key ingredient for survival and prosperity in the 1990's. The U.S. industry's quality consciousness has been raised by the fierce competition of the international market. This challenge has instigated a commitment by the American industry to quality in all areas, particularly in the areas of product quality and customer service. As stated by President Bush during the 1989 Malcolm Baldrige National Quality Award ceremony, "the improvement of quality in products and the improvement of quality in service - these are national priorities as never before." [Ref. 1:p. 4] In evaluating quality performance, industry has recognized that not only are internal factors responsible for the quality of a product or service but that external factors also play an important role. Suppliers of products and services which are incorporated into the final product of a firm are external factors which have the greatest impact.

B. OBJECTIVE

This study focused on supplier quality assurance programs of firms which do business with the Department of Defense as either a prime contractor or subcontractor. The implications of products and services incorporated in an end-use product is significant. The study attempted to identify current practices used by these companies for ensuring that the products and services provided by suppliers are of the highest possible quality. Supplier quality assurance practices of the Malcolm Baldrige National Quality Award winners were also identified for comparison purposes.

Practices which reduce or eliminate the monitoring and surveillance of suppliers enable companies to run more efficiently. The inevitable results of quality improvement are increased levels of service and production, ultimately leading to higher profits. The objective of this study was to ascertain to what extent these practices are used by defense contractors.

C. THE RESEARCH QUESTION

The principal research question was: What are the principal practices commercial firms use in reducing or eliminating the oversight of suppliers. Subsidiary research questions were:

1. What type of relationship do industrial customers establish with their suppliers during contract performance to ensure an on-time, quality product?

2. What are the principal inspection and acceptance procedures industry uses in order to reduce or eliminate the monitoring and surveillance of suppliers?

3. How and to what extent does industry certify its suppliers?

D. SCOPE, LIMITATIONS AND ASSUMPTIONS

The study identified the practices used throughout industry in reducing or eliminating the surveillance or monitoring of suppliers. In particular, the supplier quality assurance practices incorporated by the winners of the Malcolm Baldrige National Quality Award were compared to supplier quality assurance practices used by defense contractors. The focus was to use the practices of the Baldrige Award winners as a benchmark in evaluating defense contractor practices and evaluate how the Government affects the defense contractors efforts in supplier quality assurance.

This study was limited by the participation of a small number of defense contractors. In addition, not all of the firms which have received the Baldrige Award participated in the study.

It is assumed that the reader is familiar with Government procurement policies and practices as well as with laws and

regulations that affect Government procurement. The reader should also have a basic knowledge of Total Quality Management/Continuous Quality Improvement concepts.

E. LITERATURE REVIEW

A review of the literature pertinent to current practices used by commercial firms in reducing supplier oversight along with DoD studies on the subject was conducted. The DoD studies included the 1988 DoD report "Bolstering Defense Industrial Competitiveness", [Ref. 2] the Report On The Joint OSD - Air Force - Industry Total Quality Management Impediments Process Action Team Findings And Recommendations, [Ref. 3] and the Report of the Defense Systems Management College 1988-89 Military Research Fellows. [Ref. 4] Germane findings of these DoD studies which were significant to this research and a review of current commercial practices discussed in trade publications and other literature is presented.

F. METHODOLOGY

This study was accomplished through a survey questionnaire. The first step was to identify defense contractors, in addition to firms which have received the Malcolm Baldrige National Quality Award. The following actions were taken to identify such firms:

- conversations were held with the Office of the Assistant Under Secretary of Defense for Acquisition (Quality) and the Aerospace Industries Association of America asking for the names and addresses of firms which do business with the Government as either prime contractors or subcontractors;
- conversations were held with the U.S. Department of Commerce, National Institute of Standards and Technology asking for the names and addresses of companies which have received the Malcolm Baldrige National Quality Award;

The second step was to send questionnaires to these firms. Appendix A contains a sample letter sent to defense contractors and Appendix B contains a sample letter sent to recipients of the Baldrige Award. Appendix C contains the questionnaire which was enclosed with the letters. A total of 100 questionnaires were mailed.

G. ORGANIZATION OF STUDY

Chapter II presents as background the impetus behind the increased awareness in industry of the importance of supplier quality assurance in providing high quality goods and services. Total Quality Management and Continuous Quality Improvement concepts which influence supplier quality assurance in addition to the Malcolm Baldrige National Quality Award are discussed.

Chapter III presents the findings of the comprehensive literature review conducted for this research. The discussion focuses on the findings of recent DoD studies and on informa-

tion found in trade publications and other literature regarding commercial supplier quality assurance practices.

Chapter IV presents the data collected for this research through survey questionnaires and literature provided by participants in this study. An interpretation and analysis of the data is also presented.

Chapter V presents conclusions and recommendations of the study along with areas that might merit further research.

II. BACKGROUND

A. INTRODUCTION

Supplier performance has a great influence on the final product or service provided to an end-use customer. In general, industry rates suppliers on their ability to produce high-quality goods or services, on time, and at a fair price. A variety of supplier evaluation systems exist throughout industry and many of these use essentially the same criteria for evaluating suppliers. What are these criteria? Should the Federal Government require the use of these practices by defense contractors? Has the defense industry in general adopted the commitment to improve the overall quality of their products and services? How has it affected the supplier base?

This project attempts to identify common supplier quality assurance practices used throughout industry. Specifically, the practices incorporated by the winners of the Malcolm Baldrige National Quality Award and the practices used by some of the major defense contractors will be examined.

B. TOTAL QUALITY MANAGEMENT/CONTINUOUS QUALITY IMPROVEMENT

Achieving high levels of quality has become an increasingly important element in competitive success. In recent years a number of U.S. companies found that they could not achieve world-class quality by using traditional approaches to

managing product and service quality. To enhance their competitive position, some American companies reappraised their traditional view of quality and adopted what is known as the "Total Quality Management" philosophy in running their businesses.[Ref. 5:p. 2]

1. Total Quality Management Definition

Total Quality Management (TQM) is both a philosophy and a set of guiding principles that represent the foundation of a continuously improving organization. TQM is the application of quantitative methods and human resources to improve the material and services supplied to an organization, all the processes within an organization, and the degree to which the needs of the customer are met at present and in the future. TQM integrates fundamental management techniques, existing improvement efforts, and technical tools under a disciplined approach focused on continuous improvement. [Ref. 6:p. 1]

The TQM philosophy provides a comprehensive way to improve quality by examining the way work gets done in a systematic, integrated, consistent, organization-wide perspective. The focus is to: [Ref 6:p. 3]

- Institutionalize continuous improvement of processes, not merely compliance with standards.
- Manage to improve processes from within, rather than wait for complaints/demands from users.
- Involve all functions, not just the quality organization.

- Enable employees to become the driving force for improvements.
- Use guides and target values as goals to improve on.
- Use appropriate process control techniques.
- Understand the effects of variation on processes and their implications for process improvement.
- Design in quality, not inspect out defects.
- Emphasize optimum life cycle cost (best value), not merely lowest initial procurement cost.
- Involve suppliers in the improvement process as a responsive partner, not as adversaries.

2. Continuous Quality Improvement

Synonymous to TQM is the Continuous Quality Improvement (CQI) concept. A major defense contractor defines CQI as a philosophy and an attitude for analyzing capabilities and processes and improving them repeatedly to achieve the ultimate objective of customer satisfaction.

[Ref. 7:p. 4]

Customer satisfaction is the result of meeting or exceeding customer expectations for quality, schedule, and cost. The relationship between quality and cost is value, and value is what customers want. Continuous improvement is a proven way to increase value to customers.[Ref. 7:p. 4]

Underlying the continuous improvement concept is the idea that better quality does not cost more, but that better quality and lower cost, i.e., greater value, can be achieved at the same time.[Ref. 7:p. 5]

The method is to focus on improving the direct and indirect work processes, in the organization as well as its suppliers, that ultimately result in delivered products and services. The goal is to eliminate activities that add no value and bottlenecks that stand in the way of superior performance, with the understanding that good processes make good products and services.[Ref. 7:p. 5]

A basic concept is that each organization involved in a process is both a supplier and a customer. In daily activities, needed inputs are gathered from suppliers and work processes are performed to produce outputs for customers. Each organization states their requirements to their suppliers and gives them feedback on how well they met those requirements. At the same time, requirements are received from customers and they provide feedback on how well their requirements are met.[Ref. 7:p. 5]

C. THE MALCOLM BALDRIGE NATIONAL QUALITY AWARD

For many years the traditional way to achieve quality has been through systematic final inspection of goods or services. This approach is referred to as "inspecting in quality". Intense foreign competition has led some U.S. companies to adopt TQM/CQI practices, which are prevention based. This approach is often referred to as "building in quality".

The most widely accepted formal definition of what constitutes a TQM/CQI company exists in the criteria for the

Malcolm Baldrige National Quality Award. This annual award, given by the U.S. Department of Commerce, recognizes companies that excel in quality achievement and quality management. [Ref. 6:p. 2]

The Malcolm Baldrige National Quality Award was created by Public Law 100-107 and signed into law on August 20, 1987. The Award Program, responsive to the purposes of Public Law 100-107, led to the creation of a new public-private partnership. [Ref. 8:p. 43]

The Findings and Purposes Section of Public Law 100-107 states that:

1. The leadership of the United States in product and process quality has been challenged strongly (and sometimes successfully) by foreign competition, and our Nation's productivity growth has improved less than our competitors' over the last two decades.
2. American business and industry are beginning to understand that poor quality costs companies as much as 20 percent of sales revenues nationally and that improved quality of goods and services goes hand in hand with improved productivity, lower costs, and increased profitability.
3. Strategic planning for quality and quality improvement programs, through a commitment to excellence in manufacturing and services, are becoming more and more essential to the well-being of our Nation's economy and our ability to compete effectively in the global marketplace.
4. Improved management understanding of the factory floor, worker involvement in quality, and greater emphasis on statistical process control can lead to dramatic improvements in the cost and quality of manufactured products.
5. The concept of quality improvement is directly applicable to small companies as well as large, to service industries as well as manufacturing, and to the public sector as well as private enterprise.

6. In order to be successful, quality improvement programs must be management-led and customer-oriented, and this may require fundamental changes in the way companies and agencies do business.

7. Several major industrial nations have successfully coupled rigorous private-sector quality audits with national awards giving special recognition to those enterprises the audits identify as the very best.

8. A national quality program of this kind in the United States would help improve quality and productivity by:

a. helping to stimulate American companies to improve quality and productivity for the pride of recognition while obtaining a competitive edge through increased profits;

b. recognizing the achievements of those companies that improve the quality of their goods and services and providing an example to others;

c. establishing guidelines and criteria that can be used by business, industrial, governmental, and other organizations in evaluating their own quality improvement efforts; and

d. providing specific guidance for other American organizations that wish to learn how to manage for high quality by making available detailed information on how winning organizations were able to change their cultures and achieve eminence.

Among the philosophies the Award promotes are:

[Ref. 8:p. 1]

- Awareness of quality as an increasingly important element in competitiveness.
- Understanding the requirements for quality excellence.

Companies participating in the Award process must complete an award examination. The award examination is based upon criteria designed to be a quality excellence standard for

organizations seeking the highest levels of overall quality performance and competitiveness. It addresses all key requirements to achieve quality excellence, as well as the important interrelationships among these key requirements, and comprises seven categories that represent the major components of a quality management system.[Ref. 8:p. 2]

Two of the seven categories in the Baldrige Award criteria deal directly with product quality. The Quality Assurance of Products and Services category of the examination scrutinizes the systematic approaches used by the company for assuring quality of goods and services based primarily upon design and control, including control of procured materials, parts and services.[Ref. 8:p. 12] One section of this category is Supplier Quality, which describes how the quality of materials, components, and services furnished by other businesses is assured, assessed, and improved. The areas this section addresses are:[Ref. 8:p. 14]

- Approaches used to define and communicate the company's specific requirements to suppliers. Included are the principal quality indicators the company uses to communicate and monitor supplier quality.
- Methods used to assure that the company's quality requirements are met by suppliers. Methods may include audits, process reviews, receiving inspection, certification, and testing.
- Strategy and current actions to improve the quality and responsiveness of suppliers. These may include partnerships, training, incentives and recognition, and supplier selection

The Quality Results category examines quality levels and quality improvement based upon objective measures derived from analysis of customer requirements and expectations, and from analysis of business operations. One section of this category is Supplier Quality Results, which summarizes trends and levels in quality of supplies and services furnished by other companies, and compares the company's supplier quality with that of competitors. The areas this section addresses are:[Ref. 8:p. 15]

- Trends and current levels for the most important indicators of supplier quality.
- Comparison of the company's supplier quality with that of competitors and/or with benchmarks. The comparisons include industry averages, industry leaders, world leaders, principal competitors in the company's key markets and appropriate benchmarks.

A number of key concepts which together underlie all requirements make up the basis of the examination. One of the key concepts is that quality is defined by the customer. Value, satisfaction, and preference may be influenced by many factors throughout the overall purchase, ownership and service experiences of customers. This includes the relationship between the company and customers, and the trust and confidence in products and services that leads to loyalty and preference. Thus quality is judged by the customer and customer-driven quality is a strategic concept which demands constant sensitivity to customer and market information. It

also demands rapid response to requirements, which extend well beyond defect and error reduction, merely meeting specifications, or reducing complaints, notwithstanding the fact that defect and error reduction, and elimination of causes of dissatisfaction, contribute significantly to the customers' view of quality.[Ref. 8:p. 2]

Another key concept is that continuous improvement must be a part of the management of all systems and processes. Achieving the highest levels of quality and competitiveness requires a well-defined and well-executed approach to continuous improvement. Improvements may be of several types:

- Enhancing value to the customer through improved product and service attributes.
- Reducing errors and defects.
- Improving responsiveness and cycle time performance.
- Improving efficiency and effectiveness in the use of all resources.

Thus improvement is driven not only by the objective to provide superior quality, but also by the need to be responsive and efficient.[Ref. 8:p. 2]

A third key concept is that companies need to communicate quality requirements to suppliers and work to elevate supplier quality performance. This entails involving suppliers early in the supply cycle, establishing partnerships with suppliers, training suppliers, and providing incentives and recognition to the best suppliers.[Ref. 8:p. 2]

Although the Award has its critics, many believe that it has become the standard of excellence in U.S. business and it is considered as the catalyst which encourages U.S. industry's quest for quality. It means that the winner is producing goods or services that are the equal of any in the world and that their quality continues to improve. A survey conducted in January and February of 1990 among 550 executives in the top 1000 U.S. corporations showed that winning a prestigious national award for quality makes a difference when choosing a supplier. [Ref. 9:p. 26]

D. SUMMARY

Providing excellent product and service quality has become a key to success in competitive markets. Intense foreign competition has instigated a cultural change in some U.S. companies, leading them to embrace the TQM/CQI philosophy in order to remain competitive. This philosophy provides a comprehensive way to improve quality and focuses principally on the continuous improvement process. A basic concept of this philosophy is improving the organization's work processes, direct and indirect, as well as those of the organization's suppliers.

The Malcolm Baldrige National Quality Award is a widely accepted criteria for defining a Total Quality Management company. Among the philosophies of the award are:

- Awareness of quality as an increasingly important element in competitiveness.
- Understanding the requirements for quality excellence.

Total Quality Management, along with the Baldrige Award, is influencing relationships between companies and their suppliers. Major companies are telling their suppliers that they will make meeting the award's objectives a condition of doing business with them.

The supplier base has been greatly affected. Through extensive efforts in applying TQM concepts and meeting Baldrige Award criteria, many companies have made fundamental changes in the way they do business with suppliers, which in the process has led to increased reliability of their products and improved customer service. They are ensuring that products are made right the first time, not fixed after they come off the assembly line. Businesses realize that it is not just a matter of pride. It is a matter of survival in today's highly competitive environment. As stated by a top executive of a leading corporation, "if we don't take this kind of action, we're simply not going to survive the competition around the world." [Ref. 10:p. 44] The improvement of quality in products and service has become a

national priority and foreign competition has given U.S. businesses the incentive to renew their commitment to excellence.

The next chapter will review current DoD and commercial literature found on supplier quality assurance practices in industry. The discussion will focus on findings of recent studies conducted by DoD and non-DoD organizations.

III. LITERATURE REVIEW

A. INTRODUCTION

The current literature on supplier quality assurance provides ample evidence of the changing attitude on supplier relationships. The opinion of Hayes, Wheelwright, and Clark of Harvard Business School is representative of what can be found in the current literature. They found that one important characteristic of what they consider a "world-class manufacturer" was a redefined relationship with a fewer number of top quality suppliers. [Ref. 4:p. 60] Specifically, they stated: [Ref. 11:p. 193]

...it is essential that suppliers change from arm's-length adversaries to co-makers. Under the co-maker view, the buyer organization seeks close relationships with a few key vendors over the long-term.

B. DEPARTMENT OF DEFENSE LITERATURE

In December 1989, a 1988-89 Military Research Fellows Report of the Defense Systems Management College entitled "Using Commercial Practices In DoD Acquisition: A Page From Industry's Playbook" found that companies are adopting more cooperative relationships with their suppliers. [Ref. 4:p. 59] Specifically, firms are attempting to reduce their supplier base, and are trying to fundamentally redefine their relationship with suppliers. The central elements of this movement

are long-term arrangements with a small number of high quality suppliers; relationships characterized by mutual dependence and open communications.[Ref. 4:p. 59] The report also stated that a number of innovative commercial practices, such as Total Quality Management (TQM) and Just-in-Time (JIT), are responsible for this trend toward a closer, more cooperative relationship with suppliers.[Ref. 4:p. 61]

The TQM philosophy with regard to supplier relationships is that long-term, sole-source relationships are the most beneficial to the parties involved. Dr. W. Edwards Deming, considered by some as the father of the third wave of the industrial revolution, and by many as the ultimate authority on TQM, rejects the idea that "competition in the marketplace gives everyone the best deal", arguing that the leverage of competition may get the best price in the short term, but at the cost of reduced quality, which in the long term reduces value.[Ref. 4:p. 61]

The JIT philosophy has also affected supplier relationships. Originally, JIT was thought of as a kind of inventory management system. But it was soon recognized that JIT had as great an effect on supplier relationships as on inventory management. The JIT movement can be credited for some of the gains made on quality by U.S. firms over the past decade. It is recognized that a company cannot operate in a JIT mode without good quality and the only way to guarantee quality is

to make sure every process is under control, starting with the processes of suppliers.[Ref. 12:p. 55]

However, this change in attitude towards suppliers does not seem to have caught on within DoD. In July 1988, the Under Secretary of Defense (Acquisition) submitted a study to the Secretary of Defense entitled "Bolstering Defense Industrial Competitiveness". Some major findings of this study were:[Ref. 2:p. 36]

- Requirements of the competition advocates for free and open competition for subcontractors and suppliers have the effect of keeping the supplier base in constant turmoil and make it virtually impossible for defense contractors to build a stable base of reliable, high quality, cost-effective vendors.
- Emphasis on price competition by the Congress and the Department of Defense effectively precludes the development of long-term relationships between prime contractors and suppliers and stimulates an adversarial relationship between them. The absence of long-term relationships does not permit extended, cooperative design, development, and manufacturing exchanges between the primes and suppliers. Little or no emphasis is placed on value analysis or value engineering by suppliers or their primes.
- Annual price competitions are weakened by the refusal of many of the best-qualified suppliers to participate due to their reluctance to become involved in complex, expensive, and non-productive Government rules and regulations. Many desirable, highly-qualified suppliers refuse to do business with defense prime contractors because of the sheer weight of compliance with the body of laws, regulations, rules, and procedures that primes are required to pass through from the Government to them.

In June 1989, the Joint OSD-Air Force-Industry Total Quality Management Impediments Process Action Team, formed in December 1988 and made up of representatives from the Air

Force, Deputy Assistant Secretary of Defense and Industry, submitted a report on its findings and recommendations. A major finding of the team was that laws such as the Competition in Contracting Act (CICA) result in a proliferation of bids for Government contracts and a multitude of suppliers. [Ref. 3:p. 17]

The team also found that: [Ref. 3:p. 8]

- DoD contracting policy and process emphasize low price in lieu of high quality. Most contracts continue to go to the lowest price bidder among the technically acceptable and responsible offerors.
- Government contract administration procedures and practices are not in consonance with TQM philosophy, goals and objectives. A specific example that typifies this condition is in the functional area of quality assurance.
- DoD's quality assurance system is based on inspection. There are no means for switching over from reliance on end product inspection to a process approach and control.
- Lack of multi-year contracts impede long-term relationships. DoD's inability to use multi-year contracts because of congressional limitation and funding constraints retards the development of long-term contractor improvement programs and does not allow for longer term improvements.

These practices are contrary to establishing long-term relationships with suppliers and reducing the supplier base, which is a fundamental tenet of Total Quality Management (TQM). Other issues which were presented and discussed by the team were:[Ref. 3:p. 32]

- Past and present arms length (where inappropriate) and/or adversarial relationships in the acquisition process may impede TQM implementation.

- Too much emphasis on funds obligation sends a message that DoD is interested in other than quality as a top priority.
- There is a systemic bias against single sources.
- Currently there are insufficient penalties for poor performance of suppliers (contractors).

The DSMC report alluded to earlier found the following major inhibiting factors to DoD contractors: [Ref. 4:p. 63]

- Government advocacy for full and open competition
- DoD intervention in contractor's internal management
- DoD intervention into contractor's sourcing decisions

The primary inhibitor to effective supplier partnering by defense contractors is DoD's advocacy for full and open arm's length competition for subcontracts under defense contracts. The Government is interested in the economic merits of bargaining parity and a self-regulated price offered by competition. It is a widely-held perception in Government circles that competition does, in fact, lead to a superior product at a lower price. Beyond these economic considerations though, the Government embraces competition because of another important dimension - the connotation of equity it conveys. Full and open competition conducted at arm's length gives the public a perception of fairness and integrity in the use of their tax dollars.[Ref. 4:p. 62]

DoD prime contractors do not have complete flexibility dealing internally and externally with other commercial firms.

The DoD dictates through a number of requirements how its contractors are to conduct business. Many of these requirements flow through prime contractors directly to subcontractors and suppliers.[Ref. 4:p. 63]

The DoD is particularly interested in how its prime contractors carry out their sourcing function and imposes oversight and control through requirements such as Contractor Purchasing System Reviews (CPSR), subcontractor consent and notification, and subcontractor plans. DoD wants its contractors to emulate the methods and procedures it uses in awarding prime contracts, including the use of full and open competition.[Ref. 4:p. 63]

The DoD has a direct influence on how prime contractors do business with subcontractors and suppliers and the degree to which DoD exerts that influence to advocate competition in awarding subcontracts will inevitably affect the degree to which defense contractors pursue more cooperative relationships with their suppliers.[Ref. 5:p. 64]

C. COMMERCIAL LITERATURE

Information on commercial supplier quality assurance practices is prevalent in the current literature. Many trade magazines have covered the topic in recent publications. Much of the literature focuses on the following topics:

- Reducing the supplier base

- Establishing long-term relationships
- Early supplier involvement
- Supplier development
- Supplier training
- Supplier recognition

1. Reducing the Supplier Base

The supplier base is being consolidated and supplier rating programs are sprouting throughout industry. A survey conducted by Purchasing magazine shows that suppliers are being subjected to formal and detailed performance surveys on everything from product quality and delivery schedules to receipt of technical data sheets and timely billing paperwork.[Ref. 13:p. 92] There now are supplier rating programs at almost two-thirds of the major manufacturing firms in the country. Seventy-two percent are designed solely to monitor and improve the quality of products and services from existing or new suppliers. There are as many supplier-rating systems in place to eliminate poor quality or overpriced suppliers as there are programs to build long-term partnerships. The active supplier base is being reduced by natural evolution to the absolute best suppliers in any given field, and extraneous suppliers that once may have been kept for convenience are being eliminated. The survey also concluded that a vast majority of the formal rating programs now in place will be even tougher by mid-decade.[Ref. 13:p. 92]

Many of these supplier-rating programs constitute the cornerstone upon which firms are building their supplier-customer relationships, and are highlighted by sourcing inspection-free materials from a smaller pool of suppliers who show statistical evidence of continuous quality and cost-reduction efforts.[Ref. 13:p. 93] In addition, the evolution of Just-in-Time practices has led to fewer but better suppliers.

Other results of the survey were:[Ref. 13:p. 95]

- approximately 70 percent of the suppliers to the industrial U.S. are being rated today, up from fifty percent a year ago;
- almost 95 percent of the suppliers of production materials and 65 percent of the industrial commodities are being audited;
- supplier ratings have been expanded to include approximately 45 percent of suppliers of manufacturing services, 30 percent of suppliers of transportation services, and 25 percent of suppliers of the material handling services. Also being audited are 35 percent of the Maintenance, Repair and Operating (MRO) goods suppliers and 33 percent of the office products suppliers;
- quality remains the most important factor of any supplier-rating system, followed in order by delivery, service, price, and technical expertise. Figure 2.1 shows the breakdown of how important these factors are;
- approximately 58 percent of the ratings are handled on a monthly, semi-monthly, or quarterly basis. Figure 2.2 shows the breakdown for the frequency of the ratings;
- the primary reason suppliers are audited is to improve quality. Other reasons are cost-reduction efforts, the elimination of incoming inspections, supplier reduction programs, rewarding superior supplier performance with more business and to improve delivery. Figure 2.3 shows the breakdown of the reasons for auditing suppliers.

Figure 2.1

Basis of Rating System

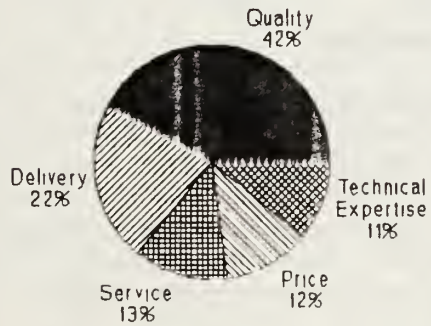


Figure 2.2

Timing of Review

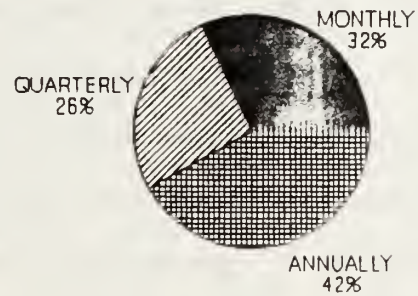
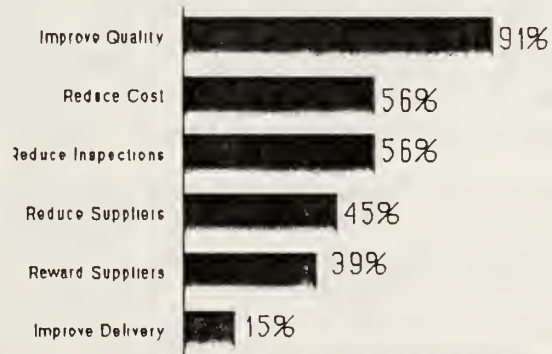


Figure 2.3

Reason for Rating Supplier



The consolidation of the supplier base has led to supplier-rating programs becoming more punitive. Twenty-seven

percent immediately disqualify a supplier for poor performance results and 31 percent give notice to suppliers that achieve below-goal ratings demanding immediate self-correction. Only 41 percent said they would work to help suppliers improve.

[Ref. 13:p. 97]

2. Close Long-Term Relationships

Firms are becoming increasingly involved in "strategic partnership" type relationships with suppliers. A strategic partnership is defined here as a mutual, ongoing relationship involving a commitment over an extended time period, and a sharing of information and the risks and rewards of the relationship.[Ref. 14:p. 8] Awarding long-term contracts to suppliers is visible evidence of a partnering approach. By establishing long-term relationships, companies work closely with suppliers and suppliers are more willing to participate in improving product quality and increasing their capital investment. In many cases, adversarial relationships have been replaced by partnerships. In establishing these relationships, many of the companies have reduced the number of suppliers for three main reasons:

[Ref. 15:p. 65]

1. Supplier development is costly and cannot be made cost effective unless it is limited to the suppliers with which they do sizable business.
2. The close supplier working relationship they are trying to achieve requires that they restrict the number of suppliers they work with.

3. A small supplier base ensures that the suppliers committed to partnership and quality improvement are properly rewarded with substantial business.

A supplier partnership develops between companies who trust each other, have common values, and are interested in each other's success. Many of the companies see their suppliers as extensions of their facilities, working responsibly on mutually acceptable goals and objectives. Once a long-term relationship is established, leadtimes and inventory can be reduced, and the suppliers feel comfortable in committing to better prices, quality and delivery. [Ref. 16:p. 73] Firms with advanced supplier partnering programs know exactly where they are heading, which is toward creation of technical alliances, supplier-generated technical improvements geared toward their end product, improved flow of ideas between the companies and their suppliers, improvements aimed at better manufacturability, and a buyer-supplier climate that makes cycle-time reduction a real possibility. [Ref. 15:p. 65]

3. Early Supplier Involvement

Early supplier involvement facilitates open and consistent communications with suppliers. Not only are the company's short and long-range goals communicated, but the suppliers are brought in to contribute their design and engineering expertise, make recommendations and innovations, and discuss problems of design and quality. [Ref. 15:p. 69]

Integrating them into the process, suppliers should be considered no different from the company's own manufacturing.[Ref. 17:p. 87]

Early supplier involvement in design development and the availability of supplier technical knowledge throughout the entire process ensures production without dramatic changes. Using the loose specifications approach, suppliers are given more freedom to meet specifications. Specifications can be "loose" with the company relying more on limited performance specifications and less on narrowly defined design specifications. Also, technical assistance from suppliers in the design process can ensure and upgrade the quality of parts produced. Under this approach, the suppliers have an incentive to perfect quality.[Ref. 16:p. 107]

Early supplier involvement is more important than ever. [Ref. 18:p. 36] One reason is that product life cycles are getting shorter and in many instances getting a product to market on time is an important factor in determining a product's ultimate profitability. Another is that technology is advancing so rapidly that the only way to keep up with the latest developments is to work with the supplier early on in the product development cycle. A third reason is that the design of a part is influenced by how the part is to be made, and vice versa. This is the principal tenet of simultaneous or concurrent engineering. Simultaneous engineering not only confirms the supplier's role on the design team but also makes

his early involvement in the design process a matter of utmost importance.[Ref. 18:p. 37]

4. Supplier Development and Supplier Training

The cutting edge of supplier development appears to lie in the ability to bring suppliers into product and production planning.[Ref. 15:p. 65] Having a plan for supplier support and getting suppliers involved in the early stages of product development is essential. In addition, many companies work closely with smaller businesses and go well beyond sourcing business to them. They help smaller companies develop and grow to ensure their long-term success by providing financial and managerial assistance to qualified suppliers.[Ref. 19:p. 55]

Closely related to supplier development is supplier training. Many of the companies have a formal approach to educating their suppliers in statistical process control, value analysis, price/cost analysis and quality improvement techniques. Some of the training programs are part of the certification process.[Ref. 15:p. 63] Others are aimed at corrective action. In fulfilling the supplier partnership concept, they assist and support in efforts for continuous improvement to satisfy suppliers' business needs as well as their own.[Ref. 20:p. 81]

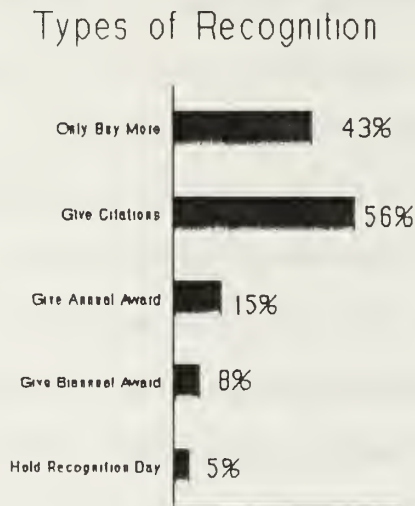
5. Supplier Recognition

The best recognition that a supplier can receive is continued business. Many companies accomplish this by awarding long-term contracts to qualified suppliers.

[Ref. 21:p. 103] In addition, the recognition process for suppliers is a highly visible, motivating force for them. For many companies, supplier recognition activities, such as annual awards given to the top suppliers, are a natural extension of those used within the company.

[Ref. 22:p. 20] Being recognized as a top quality company enhances the supplier's reputation which in turn rewards them financially through increased market share.

Figure 2.4



D. SUMMARY

This chapter presented findings of recent studies conducted by DoD and non-DoD organizations. "Using Commercial Practices in DoD Acquisition: A Page From Industry's Playbook", a 1988-89 Military Research Fellows Report of the Defense Systems Management College, found that companies are making long-term arrangements with a reduced number of suppliers and fundamentally redefining supplier relationships by adopting more cooperative relationships characterized by mutual dependence and open communications.

Another DoD study, "Bolstering Defense Industrial Competitiveness", found that Government requirements for competition, along with its emphasis on price instead of quality, present obstacles which make it difficult if not impossible for defense contractors to establish effective long-term relationships with a small number of high quality suppliers.

A third DoD study, conducted by a joint OSD, Air Force, and Industry Process Action Team, found that DoD policies and practices are contrary to fundamental tenets of Total Quality Management and corroborated the findings of the earlier DoD study with respect to defense contractors establishing long-term relationships with suppliers.

Studies conducted by Non-DoD organizations found that commercial supplier quality assurance policies and practices facilitate establishing long-term relationships with a reduced number of suppliers, encourage involving suppliers early in

the acquisition process as well as developing and training suppliers, and recognize suppliers as partners in achieving mutually beneficial goals.

Any study of supplier quality assurance practices should recognize the results of these earlier efforts. The focus of this study is on the latest trend in defense contractor efforts in this area. The next chapter will present an analysis of the data obtained in this study.

IV. SURVEY RESPONSES AND ANALYSIS

A. INTRODUCTION

Data for this study were obtained through a survey mailed to defense contractors and to companies who have received the Malcolm Baldrige National Quality Award. The survey attempted to determine the supplier quality assurance practices used by each company. Anonymity was afforded to all organizations which responded to the questionnaire in case they did not wish to be identified as sources of company names for this project.

B. RESPONSE TO SURVEY

Table 4.1 identifies the breakdown concerning the number of letter requests sent to defense contractors and Baldrige Award winners soliciting information concerning supplier quality assurance practices.

LETTERS MAILED TO DEFENSE
CONTRACTORS AND COMPANIES
WHICH HAVE RECEIVED THE
MALCOLM BALDRIGE NATIONAL
QUALITY AWARD REQUESTING
INFORMATION CONCERNING
SUPPLIER QUALITY ASSURANCE

<u>Defense Contractors</u>	<u>Baldrige Winners</u>	<u>Total</u>
91	9	100

Source: Developed by Researcher

TABLE 4.1

Letters were mailed to the following:

Defense Contractors

- 91 firms from among members of the Aerospace Industries Association of America (AIA) selected at random

Malcolm Baldrige National Quality Award Winners

- all nine companies who have received the award

Table 4.2 displays the number of questionnaires mailed and returned. One hundred questionnaires were mailed with a cover letter addressed to the principal officer in charge of Quality Assurance explaining the project. A total of 47 defense contractors and seven Baldrige Award winners returned the enclosed form for a response rate of 54 percent.

QUESTIONNAIRES MAILED/RETURNED

	<u>MAILED</u>	<u>RETURNED</u>	<u>% RETURNED</u>
Defense Contractors	91	47	52
Baldrige Winners	<u>9</u>	<u>7</u>	<u>78</u>
TOTAL	100	54	54

Source: Developed by Researcher

TABLE 4.2

C. SURVEY RESULTS

Questions one through three of the questionnaire gave the individuals an opportunity to identify themselves and indicate whether or not they were willing to discuss their views with the researcher either in person or by telephone. Ninety-nine percent of the respondents identified themselves.

Question four asked for the primary product in which firms are engaged and question five asked for the commercial and/or DoD uses of their primary product. Appendix D lists the primary products of the companies that participated in the survey.

The remainder of the responses to the questionnaire were divided into two groups. One group includes data submitted by defense contractors and the other group includes data submitted by Baldrige Award winners. The responses to the survey questions and analysis for both groups were broken down into the following categories:

1. Supplier Quality Assurance Program - questions six through ten.
2. Supplier Certification Program - questions 11 through 15.
3. Inspection and Acceptance Procedures - questions 16 and 17.
4. Supplier Improvement/Development - question 18.
5. Supplier Relationships - question 19.
6. Analysis of Supplier Quality Assurance Programs of selected companies - question 20.

1. Supplier Quality Assurance Program

Question six sought to determine if the company has an established Supplier Quality Assurance Program. As shown in Table 4.3, 46 of the defense contractors indicated they have such a program and only one stated it does not have an established supplier quality assurance program. All of the Baldrige winners stated they have an established Supplier Quality Assurance program.

SUPPLIER QUALITY ASSURANCE PROGRAM				
	<u>Defense Contractors</u>	<u>%</u>	<u>Baldrige Winners</u>	<u>%</u>
With Program	46	98	7	100
Without Program	<u>1</u>	<u>2</u>	<u>0</u>	<u>0</u>
Total	47	100	7	100
Source: Developed by Researcher				

TABLE 4.3

These results demonstrate that supplier quality assurance is a critical aspect of end-product quality. The overwhelming majority of the companies realize that suppliers play an important role in producing high-quality products and services and have put in place controls which allow them to monitor their suppliers.

There was only one response to Question seven, which asked the following:

7. If the answer to Question 6 is no, pick the reason that best fits your situation:
- a. Too expensive to establish.
 - b. Too difficult to establish.
 - c. Don't need one because we are satisfied with the quality of our suppliers.
 - d. Other (Explain)

The single response to Question seven indicated that a supplier quality assurance program was not needed because the company was satisfied with the quality of their suppliers (option c). In addition, it explained that the company has a very limited number of suppliers. This seems like a logical explanation for a company not having a Supplier Quality Assurance program. It stands to reason that if there are very few suppliers for a certain product or service, then a company requiring that product or service has very limited options with regard to those suppliers. Therefore, establishing a supplier quality assurance program would not be as effective as desired or required. However, there are some aspects of a supplier quality assurance program that could be applied to enhance the quality of suppliers.

Question eight asked how well the respondents believe their program works. Table 4.4 shows that 57 percent of the defense contractors that have an established supplier quality assurance program stated their program works very well and are very satisfied with the results it produces. Thirty percent of the defense contractors indicated their program works satisfactorily. Of these, 29 percent indicated they are

looking to improve their program. The remaining 13 percent of the defense contractors did not adequately answer the question, therefore their inputs were inconclusive. All of the Baldrige winners stated they are very satisfied with their program. However, they continuously look to fine tune it.

HOW WELL PROGRAM WORKS

	<u>Defense Contractors</u>	<u>%</u>	<u>Baldrige Winners</u>	<u>%</u>
Very Well	26	57	7	100
Satisfactorily	14	30	0	0
Don't Know/No answer	<u>6</u>	<u>13</u>	<u>0</u>	<u>0</u>
Total	46	100	7	100

Source: Developed by Researcher

TABLE 4.4

These responses seem to indicate that the majority of the defense contractors believe their supplier quality assurance programs are achieving their intended purpose of procuring high-quality products from suppliers that conform to the company's requirements. Those that indicated satisfaction with their programs realize that improvements are possible and necessary. There were no responses that indicated dissatisfaction with programs in place. All of the Baldrige respondents indicated they are extremely satisfied with their program because they have developed a comprehensive system

which has led to a reduction of defects and to improvement of the quality of their products, thus establishing an excellent record of customer satisfaction. However, even though they have excellent programs, their philosophy dictates that they must continue to seek improvement.

Question nine asked if revisions to their programs have been made recently and Question 10 sought for an explanation, if so. As shown in Table 4.5, 59 percent of the defense contractors indicated major revisions have recently been made to their programs and another two percent stated minor revisions have been made. Thirty-nine percent said no revisions have recently been made to their programs. Forty-two percent of the Baldrige winners indicated major revisions have been made recently and 29 percent stated minor revisions took place. Twenty-nine percent said no revisions have occurred recently.

RECENT REVISIONS MADE TO PROGRAM

	<u>Defense Contractors</u>	<u>%</u>	<u>Baldrige Winners</u>	<u>%</u>
Major Revisions	27	59	3	42
Minor Revisions	1	2	2	29
No Changes	<u>18</u>	<u>39</u>	<u>2</u>	<u>29</u>
Total	46	100	7	100

Source: Developed by Researcher

TABLE 4.5

This shows that the majority of the companies are looking for ways to increase the effectiveness of their programs and are adapting to the changing conditions in the quality environment. They are not satisfied with the status quo. Changes are a necessity and a key factor in the improvement of their program.

The most common explanation for making revisions to the company's supplier quality assurance program (responses to Question 10) was implementation of the TQM philosophy. This reason was given in 36 percent of the defense contractor replies and 80 percent of the Baldrige winners responses. Other reasons given were:

- Twenty-one percent of the contractor responses and 20 percent of the Baldrige responses indicated that the company implemented a Supplier Certification program where the principal objectives are to reduce defects, reduce the need for inspections, lower costs, and improve customer satisfaction.
- Fourteen percent of the contractor responses indicated that revisions were made due to a consolidation of their company, which necessitated the establishment of a common system.
- Fourteen percent of the contractor responses stated that statistical process controls (SPC) were incorporated into their program, shifting away from product inspection.
- Eleven percent of the contractor responses indicated that revisions were made by reducing redundant inspections to audits. These changes were precipitated by suppliers having a record of outstanding conformance to requirements.
- Seven percent of the contractor responses stated that revisions were made by implementing a supplier rating system.

- Seven percent of the contractor responses and 100 percent of the Baldrige winners indicated that revisions were made in order to reduce the company's supplier base.
- Four percent of the contractor responses and 20 percent of the Baldrige winners responses stated that revisions were made by implementing a supplier recognition program.
- Four percent of the contractor responses stated that revisions were made due to the reorganization of the company where, due to TQM implementation, a specific department was established to overlook the supplier quality assurance program.
- Four percent of the contractor responses stated that revisions were made to better their source selection system in order to improve supplier quality.
- Four percent of the contractor responses indicated revisions were made to allow for commercial off the shelf (COTS) to be included in the program.

As can be seen in Table 4.6, many of the companies which made changes in their program incorporated the TQM philosophy, either entirely or partially. This indicates that the TQM and continuous quality improvement principles are reaching a large percentage of suppliers either by choice or by necessity. It is no surprise that this is the case for Baldrige winners. They are recognized by industry experts as "Total Quality Management" companies and have institutionalized continuous improvement processes in all areas, including their supplier quality assurance program. Through their program, they involve suppliers in the improvement process as a responsive partner and ensure suppliers are working on continuous improvement.

REASON FOR REVISING
SUPPLIER QUALITY ASSURANCE PROGRAM

<u>Reason</u>	<u>Defense Contractors</u>	<u>%</u>	<u>Baldrige Winners</u>	<u>%</u>
Implement TQM	10	36	4	80
Implement Certification program	6	21	1	20
Consolidation	4	14	0	0
Implement SPC	4	14	0	0
Reduce inspections	3	11	0	0
Implement Rating system	2	7	0	0
Reduce supplier base	2	7	5	100
Implement Supplier Recognition program	1	4	1	20
Improve source selection/ Supplier quality	1	4	0	0
Reorganization	1	4	0	0
Include COTS	1	4	0	0

Source: Developed by Researcher

TABLE 4.6

Implementation of a supplier certification program was the second most common reason given. Certification programs will be discussed in more detail later in this chapter. It is important to note here, however, that supplier certification programs are sprouting throughout industry and defense contractors are not taking exemption to them. In addition,

note that the reason why only one of the Baldrige winners indicated the implementation of certification program as a reason is because all other Baldrige winners already have them in place.

Implementation of Statistical Process Control, which is a systematic use of statistical methods and problem solving techniques to analyze, reduce and eliminate variation in a process and improve the inherent capability of the process, was cited by several defense contractors but not by Baldrige winners. Inquiry into the reason for this revealed that all of the Baldrige winners already apply SPC methods in their operations. The use of these methods have resulted in better control on process variability caused by tools and machines within a process and have led to the manufacture of higher quality products. In contrast, SPC techniques are now being implemented by defense contractors. This is because SPC techniques have proven to be effective tools in reducing defect rates of manufactured products.

Of the remaining reasons shown in Table 4.6, reduction of the supplier base stands out the most, especially for Baldrige winners. All of the Baldrige winners which made revisions to their supplier quality assurance program have sought to reduce the number of required suppliers to a minimum. Their goal is to have fewer suppliers who show statistical evidence of continuous quality and cost-reduction efforts. This is a key factor in maintaining a manageable,

high-quality supplier base. By assessing the product needs of their organization and monitoring product quality, their companies have been able to systematically reduce their supplier base. This has resulted in greater efficiency and lower total cost for them as well as increased business for suppliers who are willing to make the necessary commitment to continuous improvement. On the other hand, defense contractors rarely mentioned reducing their supplier base. The explanation given was that, although they would prefer to reduce their supplier base, they are constrained by requirements that are inherent in the defense business. These will be discussed later in the chapter.

2. Supplier Certification Program

Question 11 asked if the company's Supplier Quality Assurance program includes a formal certification program. As demonstrated in Table 4.7, 59 percent of the defense contractors and 100 percent of the Baldrige winners answered affirmatively. Seventeen percent of the contractors indicated they do not have a formal supplier certification program and 24 percent stated they are in the process of establishing one. Combined, 76 percent of the defense contractors have or will have a supplier certification program.

FORMAL SUPPLIER CERTIFICATION PROGRAM

	<u>Defense</u> <u>Contractors</u>	<u>%</u>	<u>Baldrige</u> <u>Winners</u>	<u>%</u>
With Supplier Certification Program	27	59	7	100
In Process of Establishing Certification Program	8	17	0	0
Without Supplier Certification Program	<u>11</u>	<u>24</u>	<u>0</u>	<u>0</u>
Total	46	100	7	100

Source: Developed by Researcher

TABLE 4.7

These responses exhibit that firms are becoming more aware of the capabilities of its supplier base and that stricter measures and criteria are being required in order to ensure their suppliers meet their quality needs. Stringent certification programs are becoming the norm. It should be recognized that all of the Baldrige winners have supplier certification programs because the certification process measures the capability of suppliers in terms of their overall process stability. Certified suppliers demonstrate all the aspects of product quality and consistency required to keep their manufacturing processes on line with the quality requirements. One of the advantages of attaining certified supplier status is that it allows suppliers to enjoy longer term contracts with these companies and are considered partners in serving customers. Another advantage is that as

process capability is proven, oversight requirements are reduced. Examples of this include:

- material may be authorized for direct shipment from certified suppliers with minimal intervention from the receiving company
- suppliers are directly involved in the design process
- shipment of material upon completion of manufacture. This results in less storage space required, improvement of facilities capacity and more rapid turn-over of inventory
- more independent decision making with less involvement from the company
- greater accountability that promotes improvement in the supplier's internal quality processes
- additional benefits realized as a result of continued commitment to quality

These advantages give suppliers the incentive to pursue certification with an understanding that the benefits are advantageous for both the supplier and the company.

Question 12 solicited the percentage of suppliers who are certified by the firms who have an established supplier certification program. It is interesting to note that, as indicated in Table 4.8, the percentages for defense contractors fell primarily into the lowest level (0-10%). Other contractor responses indicated that the percentage of their certified suppliers fell into the 11-20%, 61-70%, 71-80% and 91-100% range. In contrast, the percentages for the Baldrige winners fell mostly into the highest level (91-100%). Other responses were evenly divided between the 0-10%, 11-20%, and

61-70% range. One of the Baldrige winners responses stated that this information was confidential.

**PERCENTAGE OF CERTIFIED
SUPPLIERS OF COMPANIES WITH
SUPPLIER CERTIFICATION PROGRAM**

<u>Percent of Certified Suppliers</u>	<u>Defense Contractors</u>	<u>%</u>	<u>Baldrige Winners</u>	<u>%</u>
0-10%	19	70	1	17
11-20%	1	4	1	17
21-30%	0	0	0	0
31-40%	0	0	0	0
41-50%	0	0	0	0
51-60%	0	0	0	0
61-70%	1	4	1	17
71-80%	2	7	0	0
81-90%	0	0	0	0
91-100%	<u>4</u>	<u>15</u>	<u>3</u>	<u>50</u>
Total	27	100	6	100

Source: Developed by Researcher

TABLE 4.8

Table 4.8 shows that only 15 percent of the defense contractors have certified over 90 percent of their suppliers and 70 percent of them have certified less than 10 percent of their suppliers. In comparison, 50 percent of the Baldrige winners have certified over 90 percent of their suppliers. This indicates that supplier certification seems to be in the

initial stages for many of the defense contractors. It may be that not all suppliers are subject to the certification process or, if they are, they may be working towards certification but have not yet achieved it. However, an important distinction must be made. Defense contractors face obstacles that hinder their ability to certify suppliers that Baldrige winners do not face. For example, it is more difficult for defense contractors to establish long-term relationships with suppliers than it is for Baldrige winners. These difficulties stem from the nature of the defense business, which is characterized by uncertainty, a short-term horizon, and complex requirements. Studies have shown that suppliers are reluctant to conduct business with defense contractors due to a myriad of problems they encounter which are caused in part by these factors. [Ref. 23]

Interestingly, there were two Baldrige winners that indicated they have certified less than 20 percent of their suppliers. A closer look revealed that these companies conduct business with hundreds of suppliers, making the percentage look negligible. However, these companies are pushing to continuously increase the number of certified suppliers and are aggressively encouraging suppliers to become certified.

Question 13 asked for a description of the certification process used by the company. Table 4.9 lists the procedures firms identified in their certification process and

shows that there are various procedures used throughout the companies surveyed.

CERTIFICATION PROCEDURES

<u>Procedure</u>	<u>Defense Contractors</u>	<u>%</u>	<u>Baldrige Winners</u>	<u>%</u>
On-site survey/ Audit	17	63	4	57
Evaluation/Record of Performance	12	44	2	29
Based on TQM tech- niques	3	11	7	100

Source: Developed by Researcher

TABLE 4.9

Elements which make-up a certification process were found to include the following criteria:

1. Statistical Process Control - certified suppliers are expected to have statistically based process control systems. The SPC system in place must be designed to find and remove the causes of variability within the manufacturing process. The supplier must be able to demonstrate how variability is measured in the process, how control limits are set, how control points are selected, and the mechanism that triggers the corrective action process.
2. Continuous Process Improvement - certified suppliers are expected to have a mature and stable continuous process improvement philosophy. The supplier demonstrates the level at which all employees are involved in process improvement, and tools and methods used for process improvement.
3. Accountability/Responsibility - certified suppliers must have a quality accountability structure which identifies the person within the organization with overall responsibility for quality.

4. Process Capability - certified suppliers must demonstrate the capability to produce with stable processes.
5. History - certified suppliers must demonstrate that they are able to maintain stability in their process capability. In addition to quality and delivery, supplier response to corrective action requests is considered.
6. Quality Plans - certified suppliers must provide quality plans that completely define the manufacturing process for unique products.

A comparison of the supplier certification processes revealed that the following steps were commonly required:

1. Supplier screening - suppliers are assessed for viability of a long-term business relationship. Suppliers must provide strong and consistent performance in quality, delivery, price, service, product stability and financial stability.
2. Historical performance review - suppliers are assessed for record of performance in quality and delivery to uncover problems that would preclude certification.
3. Supplier site survey - performed to assess and evaluate the supplier's processes and overall approach to quality systems.

Almost two-thirds of the defense contractors and over half the Baldrige winners include an on-site survey/audit in their process. The supplier site survey is an integral part of the certification process. It gives the supplier an increased insight into the company's expectations. Typically, the survey involves a review of organizational and operational information and in-depth tours of the supplier's facilities.

A cross-functional survey team, consisting of specialists in different functional areas which review specific processes, is common.

These certification procedures indicate that being familiar with a supplier's operations is perhaps one of the most, if not the most, important aspects of supplier certification. Through on-site surveys and audits, companies evaluate and certify the supplier's processes. The certification procedure instills confidence in the company as well as responsibility on the part of the supplier for ensuring all requirements are met. By evaluating a supplier's record of performance, companies can eliminate poor performers or, if necessary, work with marginal suppliers to improve inadequacies.

Question 14 sought to find out if companies with a supplier certification program include a periodic, formal recertification requirement. Table 4.10 reveals that 70 percent of the contractors with a supplier certification program require that certified suppliers go through a recertification. Thirty percent of the contractors do not require recertification. Of these, 38 percent stated that they evaluate their suppliers on a continuous, ongoing basis and 62 percent stated that audits of quality system and procedures are periodically conducted but formal recertification is not required. Eighty-six percent of the Baldrige winners require periodic recertification and 14 percent do not.

FORMAL RECERTIFICATION

	<u>Defense</u> <u>Contractors</u>	<u>%</u>	<u>Baldrige</u> <u>Winners</u>	<u>%</u>
Required	19	70	6	86
Not required	<u>8</u>	<u>30</u>	<u>1</u>	<u>14</u>
Total	27	100	7	100

Source: Developed by Researcher

TABLE 4.10

Table 4.10 results demonstrate that suppliers cannot disregard quality assurance efforts once they are certified. For the majority of the companies surveyed, the recertification requirement maintains visibility on the quality process. It keeps the company informed and in communication with suppliers allowing the company to exercise control over the quality of the inputs it receives. This verification process reinforces the suppliers' responsibility for ensuring all requirements are met.

Table 4.11 shows the results obtained for Question 15, which asked how often and under what circumstances suppliers are required to recertify. Fifty-eight percent of the defense contractors require their suppliers to recertify on an annual basis. Five percent require recertification every 18 months, and 11 percent require recertification every two years. The majority of the defense contractors stated they also require recertification on an as needed basis, such as facility relocation, major changes in the supplier's management

structure, poor quality performance, if no deliveries have occurred during a specified time period, such as six months or more, or implementation of new requirements such as statistical process control. There were no defense contractors who have a recertification requirement frequency greater than 24 months. The majority of the Baldrige winners require recertification every 12 months.

RECERTIFICATION FREQUENCY

<u>Frequency</u>	<u>Defense Contractors</u>	<u>%</u>	<u>Baldrige Winners</u>	<u>%</u>
Every 12 months	11	58	4	67
Every 18 months	1	5	0	0
Every 24 months	2	11	2	33
As needed basis	3	16	0	0
No answer/varies	<u>2</u>	<u>11</u>	<u>0</u>	<u>0</u>
Total	19	100	6	100

Source: Developed by Researcher

TABLE 4.11

These results indicate that the majority of the companies prefer to have a relatively short time period between certifications in order to ensure that suppliers are up-to-date on the latest requirements in quality assurance. Suppliers are looked at frequently enough to evaluate their conformance to quality requirements enabling them to take prompt action if any discrepancies are discovered. They are

expected to demonstrate continuous improvement through the upgrade of systems, procedures and working practices. In addition, suppliers are expected to have in place a system for self-assessment which drives the process of improvement from within.

3. Inspection and Acceptance

Inspection and acceptance procedures were identified for both certified and non-certified suppliers. Most of the companies combine two or more procedures to conduct inspection and acceptance of goods.

a. Procedures for Certified Suppliers

Question 16 asked the companies to identify the inspection and acceptance procedures used for goods received from suppliers that are certified. Table 4.12 shows that a reduced emphasis on inspection and acceptance procedures is prevalent among the majority of the companies. Practices such as reduced sampling, fewer inspections, and minimum testing were identified by 41 percent of the defense contractors and 43 percent of the Baldrige winners. Direct delivery without inspection, also known as dock-to-stock, is practiced by 19 percent of the contractors and 71 percent of the Baldrige winners. Another practice, identified by 19 percent of the contractors and 57 percent of the Baldrige winners, is to rely on source inspections and the supplier's quality assurance documents such as statistical process control printouts and

certificates of conformance instead of conducting receiving inspections. Nineteen percent of the contractors stated that they use approved supplier's inspectors as their company's representative to conduct source inspections. Many of these representatives use a company approved/provided release stamp which they affix to source inspection documents. A practice identified by 19 percent of the contractors and 29 percent of the Baldrige winners is to conduct a receiving inspection for shipping damage and verification of documents only.

**CERTIFIED SUPPLIER INSPECTION
AND ACCEPTANCE PROCEDURES**

<u>Procedure</u>	<u>Defense</u>		<u>Baldrige</u>	
	<u>Contractors</u>	<u>%</u>	<u>Winners</u>	<u>%</u>
Reduced sampling/inspection/testing	11	41	3	43
Direct delivery	5	19	5	71
Rely on supplier's quality assurance documents	5	19	4	57
Use approved supplier's inspectors	5	19	0	0
Visual receiving inspection for damage only	5	19	5	71

Source: Developed by Researcher

TABLE 4.12

These practices are cost-efficient, effective, and show a decrease in supplier oversight as well as a cooperative attitude which is mutually beneficial. Companies demonstrate their trust in certified suppliers by disengaging from

oversight activities that were common but had a negative impact on supplier relationships. Responsibility for ensuring that the company's requirements are thoroughly understood rests with both the company and the supplier and this responsibility is reinforced through the use of these practices. Suppliers are expected to develop and sustain an environment where high-quality principles are practiced, achieving high levels of confidence by the companies. These practices also indicate that a unidirectional relationship is replaced by a partnership whereby both parties benefit from the results. Partnership involves teamwork, sharing resources and the elimination of the we/they approach to conducting business.

b. Procedures for Non-certified Suppliers

Question 17 asked the companies to identify the inspection and acceptance procedures used for goods received from suppliers that are not certified. Table 4.13 shows a breakdown of the procedures identified. Seventy-two percent of the defense contractors and 29 percent of the Baldrige winners require a 100% receiving inspection. Fifty percent of the contractors and 29 percent of the Baldrige winners require a comprehensive source verification inspection. These inspections are based on product conformance to procurement or specification requirements. Twenty-two percent of the contractors and 57 percent of the Baldrige winners stated that normal or tighter inspection, sampling, and testing procedures

are followed. Only four percent of the contractors indicated that they rely on the supplier's certificate of conformance when inspecting and accepting goods from non-certified suppliers.

**NON-CERTIFIED SUPPLIER INSPECTION
AND ACCEPTANCE PROCEDURES**

<u>Procedure</u>	<u>Defense Contractors</u>	<u>%</u>	<u>Baldrige Winners</u>	<u>%</u>
100% receiving inspection	33	72	2	29
100% source inspection	23	50	2	29
Use normal or tighter inspection/sampling/testing procedures	10	22	4	57
Rely on supplier's quality assurance documents	2	4	0	0

Source: Developed by Researcher

TABLE 4.13

These practices show a lack of trust in suppliers. In addition, these practices lack corrective action at the source of the problem and do not alleviate the problem of receiving and accepting nonconforming goods from suppliers. A substantial amount of time, effort, and resources are spent on inspecting and accepting goods provided by non-certified suppliers. Procedures used for non-certified suppliers are detection based rather than prevention based and result in higher operating costs that add no value to the end product.

c. Comparison of Acceptance and Inspection Procedures

A comparison of Tables 4.12 and 4.13 reveals that certified suppliers are afforded a special relationship with the companies whereas non-certified suppliers are not. The benefits obtained by certified suppliers in the area of inspection and acceptance include direct shipment of material without having to obtain approval or pass through unnecessary inspections, and an overall streamlining of the material transfer process. It is important to note that this transfer occurs with no decrement in the quality of the material. In contrast, Table 4.13 shows that non-certified suppliers must comply with procedures that disrupt the efficient transfer of material between the company and the supplier and these procedures are often redundant and unnecessary, not to mention costly.

4. Supplier Improvement/Development

Question 18 identified the number of companies that have formal programs to help suppliers improve their performance. Ninety-six percent of the contractors and 100 percent of the Baldrige winners stated that they have such programs. Only four percent of the contractors indicated that they do not have programs designed to help suppliers improve their performance. This is a strong indication that companies are moving away from adversarial relationships with suppliers and

toward a partnering approach, whereby suppliers are seen as extensions of the company.

SUPPLIER IMPROVEMENT/DEVELOPMENT PROGRAM

	<u>Defense Contractors</u>	<u>%</u>	<u>Winners</u>	<u>%</u>
With program	44	96	7	100
Without program	<u>2</u>	<u>4</u>	<u>0</u>	<u>0</u>
Total	46	100	7	100

Source: Developed by Researcher

TABLE 4.14

The most common type of support given to suppliers include:

- educating and training suppliers in the necessity of statistical process control and a quality system
- visiting supplier facilities to assist them in identifying critical process variables and in the identification and elimination of problems which degrade their processes and making recommendations on improvements
- involving suppliers early and throughout the production process

Supplier training has become a vital aspect of supplier improvement and development. Among the Baldrige winners, there are companies that have determined that the most effective method of assuring compliance with quality approaches within the supplier's facilities is to visit each supplier location with an in-house team to train the employees in at least the fundamentals of SPC. After initial training

of basic concepts, training in more advanced techniques is conducted. Since implementation of this practice, suppliers have been enabled to provide much more consistent and higher quality materials. Thus, a proactive approach such as this results in suppliers developing quality systems that are highly compatible with the company's system.

Another vital aspect is supplier assistance. Some companies have developed supplier quality improvement programs to assist suppliers in the identification and elimination of manufacturing problems. This program entails the supplier reviewing their processes and systems to determine areas that need improvement. The company may also send a team to visit the suppliers' facilities to perform a review of the plant operation. Together, problem areas are identified and a quality improvement plan is documented and put in place.

A third vital aspect is supplier involvement. Many companies expect their suppliers to be involved from concept through life of production. Continuous supplier involvement is a process in which the supplier and the company work together to optimize the design and manufacturing process and reach an agreed specification so that quality, cost, delivery and service requirements are achieved. These companies realize that it is very important to provide suppliers with complete, accurate and sufficient detailed requirements that allows the most freedom for supplier innovation. Open and continuous communication is essential.

These support efforts have contributed significantly to the operations of companies and suppliers. In the process, not only have the quality of products provided by suppliers improved but also the quality of the end product.

5. Causes of Difficulties in Establishing Long-Term Relationships

Question 19 asked if the companies have had difficulties establishing long-term relationships with suppliers. Results are shown in Table 4.15. Thirty-nine percent of the defense contractors responded affirmatively. Sixty-one percent of the contractors and 100 percent of the Baldrige winners stated they have not encountered difficulties establishing long-term relationships with suppliers.

LONG-TERM RELATIONSHIPS WITH SUPPLIERS

	<u>Defense</u> <u>Contractors</u>	<u>%</u>	<u>Baldrige</u> <u>Winners</u>	<u>%</u>
Difficulty establishing relationship	18	39	0	0
No difficulty establishing relationship	<u>28</u>	<u>61</u>	<u>7</u>	<u>100</u>
Total	46	100	7	100

Source: Developed by Researcher

TABLE 4.15

The difference among defense contractors and Baldrige winners demonstrated in Table 4.15 is significant. The

importance of establishing long-term relationships has been correlated to developing partnerships that create mutual benefits which result in increased productivity and an environment that fosters a teamwork approach toward improved quality. Long-term relationships have facilitated the ability of the Baldrige winners to work closely with suppliers in improving the quality of the end product and have promoted an alliance type environment. The suppliers' ability to be partners in the continuous improvement effort is paramount when Baldrige winners structure long-term relationships. This is perhaps the most important distinction between defense contractors and Baldrige winners. Defense contractors are not able to attain the same level of partnering due to difficulties that are intrinsic to the defense business. The causes of these difficulties are discussed in the next section.

Table 4.16 relates the causes of the difficulties encountered by 18 of the defense contractors in establishing long-term relationships with suppliers. The causes center around the following requirements and restrictions imposed by the Government:

- competition requirement
- short-term contracts requirement
- perceived cost of making improvements
- price oriented/low bid requirement

- socio-economic goals requirement
- instability of supplier base

**CAUSES OF DIFFICULTIES IN ESTABLISHING
LONG-TERM RELATIONSHIPS**

<u>Cause</u>	<u>Defense Contractors</u>	<u>%</u>
Competition requirement	5	28
Short-term contracts requirement	4	22
Perceived cost of making improvements	4	22
Price oriented/low-bid requirement	3	17
Socio-economic goals	1	6
Supplier base instability	1	6

Source: Developed by Researcher

TABLE 4.16

It is interesting to note that four of these factors were specifically identified in the 1988 DoD study "Bolstering Defense Industrial Competitiveness". [Ref. ?]

a. Competition Requirement

Five of the contractors stated that the requirement for competition posed the greatest impediment in establishing long-term relationships with suppliers. This requirement, established by the Competition in Contracting Act (CICA), makes it very difficult for defense contractors because many feel that competition is conducted for "competition's sake"

and it restricts their ability to conduct business in the most efficient and prudent manner. They prefer to establish competition when it makes good business sense.

b. Short-Term Contracts Requirement

Four of the contractors indicated lack of continuity as another cause. Statements such as "Government requirement for annual contracts" and "lack of long-term buys from the Government" described the essence of this obstacle. This requirement precludes long-range planning on the part of defense contractors and suppliers. Many contractors find that capable suppliers prefer not to rely on a system which does not guarantee long-term security.

c. Perceived Cost of Making Improvements

Four of the contractors indicated that suppliers perceived that the cost of making improvements makes it difficult to establish long-term relationships. Not all suppliers realize that the cost of not doing things right the first time usually is greater than the costs associated with establishing and maintaining an effective quality assurance system. Convincing suppliers to make major systematic changes is difficult. They stated that suppliers are reluctant to become involved in complex, expensive, and non-productive Government rules and regulations.

d. Price Oriented/Low Bid Oriented Requirement

Three of the contractors stated that the requirement of awarding to the low bidder hinders establishing long-term relationships because quality considerations are secondary to price. The emphasis on lowest price fosters an adversarial relationship between the contractor and the supplier.

e. Socio-economic Goals Requirement

One contractor manifested that the requirement to meet socio-economic goals affected the company's ability to establish long-term relationships with suppliers. Once again quality considerations do not have high priority. Emphasis is on meeting goals in order to avoid being penalized.

f. Instability of Supplier Base

One contractor responded that it is difficult to establish long-term relationships with suppliers because of instability in the supplier base. The instability is caused by the constant turmoil produced by a combination of the factors already mentioned.

All of these elements are seen as constraints on the defense contractor's ability to establish long-term relationships with suppliers. As previously mentioned, they are an inescapable dimension of the defense business with which non-defense companies do not have to contend. Without these inhibiting factors, companies such as the Baldrige

winners have the flexibility to establish closer, long-term partnerships with a smaller number of suppliers.

6. Analysis of Supplier Quality Assurance Programs

Question 20 asked if the companies could provide a copy of their Supplier Quality Assurance program. As demonstrated in Table 4.17, the responses were not as positive as desired. Only six percent of the defense contractors and 14 percent of the Baldrige winners furnished the requested information. The majority of the respondents that declined to provide a copy of their program stated that it was close-hold information designated by company policy as not releasable.

SUPPLIER QUALITY ASSURANCE PROGRAMS PROVIDED				
	<u>Defense</u> <u>Contractors</u>	<u>%</u>	<u>Baldrige</u> <u>Winners</u>	<u>%</u>
Provided copy of program	3	6	1	14
Source: Developed by Researcher				

TABLE 4.17

The Supplier Quality Assurance programs of two of the companies will be briefly discussed. One was provided by a Baldrige winner and the other by a defense contractor. They were analyzed for similarity of concepts and procedures.

Upon analysis it was found that these programs unquestionably identify with the concept of Total Quality Management. They clearly state that suppliers are expected to develop and uphold an environment where total quality

principles are practiced to achieve high levels of customer satisfaction. They base their programs on four principles. These are quality, cost, delivery and service. Their high standards require that material delivered to them be 100 percent defect free, delivered at negotiated cost, on time and that any problems identified be resolved immediately.

Most of the features that have been discussed throughout this chapter are common to their programs. These include demanding supplier certification processes, streamlined inspection and acceptance procedures and active supplier improvement and development programs.

The major difference in the two programs evolve around the long-term relationship and partnership concept. The Baldrige winner bases its supplier relationships upon partnering concepts and mutually beneficial long-term relationships with certified suppliers, not merely as another contract. Common features in partnerships formed by this company and its suppliers include:

- attract and maintain a supplier base that is committed to total quality
- purchase material from an optimum number of suppliers who practice total quality as a means to achieve world class benchmarks and who meet their requirements for quality, cost, delivery and service
- develop long-term business relationships with suppliers who are committed to becoming involved with their company's product requirements
- reward those suppliers who consistently meet their requirements with a progressively larger share of their

business as the suppliers' performance, capability and capacity warrants

There is no mention of any of these features in the defense contractor program. Therefore, the focus on long-term relationships and partnerships for each company is very divergent.

D. SUMMARY

This chapter presented the results of the survey which was conducted for this study. The findings of the survey showed that supplier quality assurance programs that are used by the defense contractors and the Baldrige winners that participated in this study include formal supplier certification procedures that are vital to the success of their program. Through certification programs, the companies communicate their quality needs to suppliers and are able to exercise better control over the quality of procured material. This is necessary in order to control the external processes that are ultimately incorporated into their own processes. In addition, supplier certification programs produce results that benefit both the suppliers and the companies. The most favorable of these is the reduction of supplier oversight which is characterized by the inspection and acceptance procedures that were discussed.

Other major findings revealed that these companies benefit from establishing cooperative long-term relationships. Many

of the companies are interested in supplier improvement and development and assist their suppliers through programs that educate and train them in quality techniques. By assisting their suppliers to improve their performance, they foster a relationship that is mutually advantageous.

The next chapter will review the conclusions and recommendations on the findings that the researcher has developed.

V. CONCLUSIONS AND RECOMMENDATIONS

A. INTRODUCTION

Although there were no major revelations in the commercial practices identified during this study, some significant conclusions can be attained from this research. They have implications for DoD procurement and should be considered in the streamlining of the procurement process.

B. CONCLUSIONS

Conclusion Number 1

Total quality is becoming a company commitment in many of the firms that participated in the study and this commitment is filtering down to suppliers. Over one-third of the defense contractors and all of the Baldrige winners have implemented TQM techniques in their supplier quality assurance programs. The continuous improvement effort is a determinant in the alliances that are being instituted between companies and their suppliers. Many of the Baldrige winners look to form partnerships with suppliers that are committed to continuous improvement and have established closer, long-term partnerships with a smaller number of suppliers who meet high quality standards. They are predisposed to evaluate the ability of suppliers to be partners in the TQM effort.

Conclusion Number 2

Supplier certification programs are a vital component of supplier quality assurance programs. Over half of the defense contractors and all of the Baldrige winners have formal supplier certification programs. These programs enable these companies to measure and control the quality capabilities of suppliers. Through certification, both defense contractors and Baldrige winners become more aware of the capabilities of their supplier base.

Conclusion Number 3

Certified suppliers are subjected to less stringent inspection and acceptance procedures than are non-certified suppliers. Over 40 percent of both defense contractors and Baldrige winners use inspection and acceptance procedures that minimize intervention in the transfer of material between suppliers and companies. Non-certified suppliers are governed by greater oversight from these companies. Over half of the companies in this study use tighter inspection, sampling and testing procedures for material received from non-certified suppliers.

Conclusion Number 4

Inspection and acceptance procedures for certified suppliers of Baldrige winners are more lenient than are inspection and acceptance procedures for certified suppliers of defense contractors. Almost 75 percent of the Baldrige winners, compared to less than 20 percent of the defense

contractors, incorporate direct delivery procedures and inspection for damage of material only.

Conclusion Number 5

Supplier improvement and development is a vital aspect of the quality process. Almost all of the defense contractors and the Baldrige winners have supplier improvement programs in place. As indicated in the analysis chapter of this study, educating and training suppliers along with assisting them to improve their performance has contributed significantly and positively to the overall operation of the companies.

Conclusion Number 6

The establishment of long-term relationships enables companies to work closely with suppliers in the improvement of the overall quality of their end product. All of the Baldrige winners seek to establish such relationships.

Conclusion Number 7

Defense contractors are not able to obtain the same level of long-term relationships with suppliers that Baldrige winners attain. This is because of complexities found in the defense business. Almost 50 percent of the defense contractors cited requirements for competition, short-term contracts, low price and socio-economic objectives as reasons for not being able to establish partnerships with a greater number of suppliers.

C. RECOMMENDATIONS

Recommendation Number 1

The Department of Defense should adopt supplier quality assurance practices which reduce supplier oversight to the maximum extent possible. Supplier oversight-reducing practices such as establishing long-term relationships, involving suppliers early in the supply cycle, and establishing supplier certification programs are effective methods of procuring high quality products at a fair and reasonable price. In this era of decreasing budgets and increasing financial constraints, implementing policies and practices which will provide the best quality of goods and services should be paramount.

Recommendation Number 2

Rules, laws and regulations, such as the Competition in Contracting Act and socio-economic goals and quotas, which interfere with defense contractors' ability to achieve higher levels of quality should be modified so that contractors are encouraged to provide the best quality products and services possible and are not hindered in their attempts to do so.

Recommendation Number 3

Recommendations given by the Total Quality Management Process Action Team in 1988 should be implemented. Full implementation of TQM throughout DoD, including the area of supplier quality assurance, is crucial in order to procure the highest quality, best value products and services.

D. ANSWERS TO THE RESEARCH QUESTIONS

Q: What are the principal practices commercial firms use in reducing or eliminating the oversight of suppliers?

A: The principal practices commercial firms use in reducing or eliminating the oversight of suppliers are:

- using supplier certification programs to ensure that processes used by suppliers provide products which meet the firms requirements
- involving suppliers early and throughout the performance of the contract
- developing suppliers and working with them to improve their performance and assure consistent, high-quality products are provided

These areas are very interrelated. One practice leads to another and together they make up the significant principles of supplier quality assurance.

Q: What type of relationship do industrial customers establish with their suppliers during contract performance to ensure an on-time, quality product?

A: Industrial customers establish close and cooperative long-term relationships with suppliers that are mutually beneficial.

Q: What are the principal inspection and acceptance procedures industry uses in order to reduce or eliminate the monitoring and surveillance of suppliers?

A: Industry reduces the monitoring and surveillance of suppliers principally by establishing supplier certification

procedures as part of their supplier quality assurance program. Inspection and acceptance procedures for certified suppliers include:

- reduced sampling/inspection/testing of products
- direct delivery (dock-to-stock) without receiving inspection
- reliance on supplier's quality assurance documents
- use of supplier's inspectors
- visual receiving inspection for shipping damage only

Q: How and to what extent does industry certify its suppliers?

A: Supplier certification is common among industry and strict certification programs are becoming standard. For the most part suppliers are certified by combining two or more of the following procedures:

- rigorous on-site surveys
- evaluation of performance history
- requiring use of Total Quality Management techniques

E. SUGGESTIONS FOR FURTHER RESEARCH

An area that merits consideration for further study is researching what actions the Federal Government, and the Department of Defense in particular, could take to encourage defense contractors to establish long-term relationships with their suppliers, how might DoD establish long-term relation-

ships with defense contractors, and what would be the advantages and disadvantages of DoD establishing long-term relationships with defense contractors.

APPENDIX A

LT Rolando Santiago
Naval Postgraduate School
SMC 1692
Monterey, CA 93943

Dear Sir:

This is a letter of introduction and a request for assistance in a Master's Thesis research project on Supplier Quality Assurance.

My name is Rolando Santiago and I am an active duty Naval Officer in the U.S. Navy Supply Corps and currently a student at the Naval Postgraduate School where I am working towards an M.S. in Acquisition and Contract Management.

My Master's Thesis research is focused on quality assurance of industrial suppliers. Specifically, my research goal is to determine the most common practices used throughout industry in evaluating supplier performance, how industry is reducing or eliminating the monitoring and surveillance of suppliers, and evaluate the feasibility of applying those practices to Federal procurement.

Supplier performance has a great impact on the final product or service provided to an end-use customer. In general, industry rates suppliers on their ability to produce high-quality goods or services, on time, and at a fair price. At present, there is not a uniform standard of supplier performance measurement used throughout industry or the Federal Government. Although there exists a variety of supplier evaluation systems throughout industry, many of these use essentially the same criteria for evaluating suppliers.

I request that you take a few minutes to complete the enclosed survey and return it at your earliest convenience. If you don't feel you are qualified to answer this survey, please pass it on to someone who is. All of your responses will remain strictly confidential. The survey results will be used for academic research analysis on Supplier Quality Assurance and for recommending Department of Defense procurement policy changes. Hopefully, any policy recommendations resulting from this survey will help improve and strengthen the business relationship between the DoD and companies such as yours. I want to thank you in advance for your assistance.

APPENDIX B

LT Rolando Santiago
Naval Postgraduate School
SMC 1692
Monterey, CA 93943
Tel: (408) 373-7879

Dear Sir:

This is a letter of introduction and a request for assistance in a Master's Thesis research project on Supplier Quality Assurance.

My name is Rolando Santiago and I am an active duty Naval Officer in the U.S. Navy Supply Corps and currently a student at the Naval Postgraduate School where I am working towards an M.S. in Acquisition and Contract Management.

My Master's Thesis research is focused on quality assurance of industrial suppliers. Specifically, my research goal is to determine the most common practices used by Malcolm Baldrige National Quality Award winners in evaluating supplier performance, how they reduce or eliminate the monitoring and surveillance of suppliers, and evaluate the feasibility of applying those practices to Federal procurement.

Supplier performance has a great impact on the final product or service provided to an end-use customer. In general, industry rates suppliers on their ability to produce high-quality goods or services, on time, and at a fair price. At present, there is not a uniform standard of supplier performance measurement used throughout industry or the Federal Government. Although there exists a variety of supplier evaluation systems throughout industry, many of these use essentially the same criteria for evaluating suppliers.

I request that you please send me a copy of your Supplier Quality Assurance program. In addition, please take a few minutes to complete the enclosed survey and return it at your earliest convenience. All of your responses will remain strictly confidential. The survey results will be used for academic research analysis on Supplier Quality Assurance and for recommending Department of Defense procurement policy changes. Hopefully, any policy recommendations resulting from this survey will help improve and strengthen the business

relationship between the DoD and companies such as yours. I want to thank you in advance for your assistance.

Sincerely,

APPENDIX C

LT Rolando Santiago
Naval Postgraduate School
SMC 1692
Monterey, CA 93943

SURVEY OF INDUSTRY ON SUPPLIER QUALITY ASSURANCE

This survey is designed to solicit information on your Supplier Quality Assurance Program. The goal of the survey is to determine the common practices used throughout industry in reducing supplier oversight. Please take a few minutes to answer these survey questions. You may remain anonymous if you wish. All answers will remain confidential and will only be used for research analysis. Thank you for your assistance.

1. (Optional)

Name: _____ Phone: _____
Title: _____
Company: _____
Address: _____

2. Are you willing to discuss your views by telephone?
Yes No

3. Are you willing to discuss your views by personal interview? Yes No

4. Please briefly describe your primary product(s):

5. Please describe the commercial and/or DoD uses for your primary product(s): (if known)

6. Do you have an established Supplier Quality Assurance program? Yes No

7. If the answer to question 6 is no, pick the reason that best fits your situation:
- _____ a. Too expensive to establish. _____ d. Other (Explain)
- _____ b. Too difficult to establish. _____
- _____ c. Don't need one because we are _____
satisfied with the quality of _____
our suppliers. _____

IF YOU ANSWERED NO TO QUESTION 6, PLEASE STOP AND RETURN THIS SURVEY USING THE ENVELOPE PROVIDED. THANK YOU FOR YOUR ASSISTANCE.

8. If the answer to question 6 is yes, how well does your program work?
- _____
- _____

9. Have you made major revisions to your program recently?
- Yes No

10. If the answer to question 9 is yes, please explain why.
- _____
- _____

11. Does your Supplier Quality Assurance program include a formal supplier certification program? Yes No

IF THE ANSWER TO QUESTION 11 IS NO, GO TO QUESTION 17.

12. If yes, what percentage of your suppliers are certified? _____

13. What is the certification procedure?
- _____
- _____

14. If you have a supplier certification procedure, is there a formal recertification requirement? Yes No

15. If yes, how often and under what circumstances are your suppliers required to recertify?
- _____
- _____

16. What inspection and acceptance procedures do you use for your certified suppliers?
- _____
- _____
- _____

17. What inspection and acceptance procedures do you use for suppliers that are not certified?

18. Do you have any programs in place to help suppliers improve their performance? Yes No

19. Have you had difficulties in establishing long-term relationships with your suppliers? Yes No If yes, briefly explain.

20. Could you provide a copy of your Supplier Quality Assurance program? Yes No

21. If you answered yes to question 20, please send a copy of your Supplier Quality Assurance program along with this survey.

THIS IS THE END OF THE SURVEY. THANK YOU FOR YOUR TIME AND EFFORT. PLEASE RETURN THIS SURVEY IN THE ENVELOPE PROVIDED.

APPENDIX D

LIST OF PRIMARY PRODUCTS OF PARTICIPATING COMPANIES

Aerospace Products
Air Cushion Landing Crafts
Air Cargo Systems
Aircraft
Aircraft Fuel Measurement and Management Systems
Aircraft Engines
Aircraft Components
Ammunition Propellants
Antisubmarine Warfare Systems
Avionics
Business Products and Systems
Command, Control and Communication Systems
Composites
Computer Systems
Electronics
Fire Protection Material
Flight Control Systems
Gas Turbine Engines
Ground Support Systems
Infrared Systems
Life Boats
Missile Guidance Systems
Navigation Systems
Pipes, Valves and Fittings
Radar Systems
Rocket Propulsion Systems
Satellite and Space Vehicle Systems
Semiconductors
Space Systems
Space Launch Vehicles
Specialty Fibers
Strapdown Guidance Systems
Submarines (Nuclear)
Surveillance Systems
Target Drones
Undersea Systems
Weapons Systems

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